

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|---|--|---|
| Applicant's or agent's file reference M04 - F - 188CT1 | FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below. | |
| International application No. PCT/JP2004/016082 | International filing date (day/month/year) 22/10/2004 | (Earliest) Priority Date (day/month/year) 26/12/2003 |
| Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO. , LTD. | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 7 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. Certain claims were found unsearchable (See Box II).

3. Unity of invention is lacking (see Box III).

4. With regard to the title,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the abstract,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the drawings to be published with the abstract is Figure No. 1

as suggested by the applicant.

as selected by this Authority, because the applicant failed to suggest a figure.

as selected by this Authority, because this figure better characterizes the invention.

b. none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/016082

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-11,32-39

Multibit memory device

2. claims: 12-20

Memory device structure

3. claims: 21-31

Memory circuit with fewer read/write errors

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP2004/016082

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G11C11/56 G11C11/34 H01L45/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G11C H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|--|------------------------------------|
| X | US 2003/038301 A1 (MOORE JOHN) 27 February 2003 (2003-02-27) | 1, 39 |
| Y | paragraph '0021! - paragraph '0027!; figure 7 ----- -/- | 2, 3, 5-11, 32-35, 37, 38 |

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

6 April 2005

Date of mailing of the international search report

18.04.2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Colling, P

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP2004/016082

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|--|----------------------------------|
| X | ZHUANG W W ET AL: "Novel colossal magnetoresistive thin film nonvolatile resistance random access memory (RRAM)" INTERNATIONAL ELECTRON DEVICES MEETING 2002. IEDM. TECHNICAL DIGEST. SAN FRANCISCO, CA, DEC. 8 - 11, 2002, NEW YORK, NY : IEEE, US, 8 December 2002 (2002-12-08), pages 193-196, XP010626021 ISBN: 0-7803-7462-2 the whole document | 1 |
| Y | | 2,3, 5-11, 32-35, 37,38 |
| A | ----- | 12-20 |
| X | US 6 583 003 B1 (HSU SHENG TENG ET AL) 24 June 2003 (2003-06-24) column 2, line 19 - column 4, line 29; figure 11 | 12-20 |
| X | US 6 344 991 B1 (MIKAMI NOBORU ET AL) 5 February 2002 (2002-02-05) column 13, line 64 - column 14, line 49; figure 60 | 12 |
| X | WO 02/19337 A (MOTOROLA, INC) 7 March 2002 (2002-03-07) | 27 |
| Y | page 7, line 26 - page 9, line 14; figure 3 | 21-24, 26,28-30 |
| Y | US 5 969 990 A (ARASE ET AL) 19 October 1999 (1999-10-19) column 11, line 1 - line 39; figure 2 | 21-24,26 |
| Y | US 6 226 197 B1 (NISHIMURA NAOKI) 1 May 2001 (2001-05-01) column 10, line 40 - column 11, line 17; figures 15,16 | 22-24, 28-30 |
| P,X | EP 1 426 966 A (SHARP KK) 9 June 2004 (2004-06-09) paragraph '0021! - paragraph '0026!; figure 1 | 1,32,37, 39 |
| P,X | EP 1 455 363 A (SHARP KABUSHIKI KAISHA) 8 September 2004 (2004-09-08) column 11, line 19 - column 14, line 45; figure 1 | 27 |
| | ----- | -/- |

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP2004/016082

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|---|-----------------------|
| A | US 6 473 332 B1 (CHARLSON E JOSEPH ET AL) 29 October 2002 (2002-10-29) column 5, line 51 – column 11, line 25 column 7, line 64 – column 8, line 31; figure 2 ----- US 6 574 138 B2 (SCHWARZL SIEGFRIED ET AL) 3 June 2003 (2003-06-03) paragraph '0001! – paragraph '0019!; figure 1 ----- | 1-20, 32-39 |
| A | US 6 278 138 B1 (SUZUKI MASAYUKI) 21 August 2001 (2001-08-21) column 1, line 45 – line 54 column 9, line 19 – line 30 ----- | 17,18 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP2004/016082

| Patent document cited in search report | | Publication date | | Patent family member(s) | | Publication date |
|--|----|------------------|--|--|----|--|
| US 2003038301 | A1 | 27-02-2003 | US | 2003222280 | A1 | 04-12-2003 |
| US 6583003 | B1 | 24-06-2003 | CN EP JP US | 1485901 A 1431982 A1 2004119958 A 2004061180 A1 | | 31-03-2004 23-06-2004 15-04-2004 01-04-2004 |
| US 6344991 | B1 | 05-02-2002 | JP TW | 2002043538 A 494567 B | | 08-02-2002 11-07-2002 |
| WO 0219337 | A | 07-03-2002 | US AU CN EP JP TW WO | 6331943 B1 8676501 A 1524269 A 1356469 A2 2004516645 T 520499 B 0219337 A2 | | 18-12-2001 13-03-2002 25-08-2004 29-10-2003 03-06-2004 11-02-2003 07-03-2002 |
| US 5969990 | A | 19-10-1999 | JP | 10214494 A | | 11-08-1998 |
| US 6226197 | B1 | 01-05-2001 | JP | 2000132961 A | | 12-05-2000 |
| EP 1426966 | A | 09-06-2004 | JP CN EP US | 2004186553 A 1505043 A 1426966 A2 2004114428 A1 | | 02-07-2004 16-06-2004 09-06-2004 17-06-2004 |
| EP 1455363 | A | 08-09-2004 | JP EP US | 2004272975 A 1455363 A1 2004174732 A1 | | 30-09-2004 08-09-2004 09-09-2004 |
| US 6473332 | B1 | 29-10-2002 | NONE | | | |
| US 6574138 | B2 | 24-10-2002 | DE CN WO JP TW US | 19942447 A1 1372687 A 0118816 A1 2003532964 T 490668 B 2002154537 A1 | | 15-03-2001 02-10-2002 15-03-2001 05-11-2003 11-06-2002 24-10-2002 |
| US 6278138 | B1 | 21-08-2001 | US | 6229159 B1 | | 08-05-2001 |